PATENT CLAIMS

1. A converter circuit for at least one phase (R, Y, B), having a first switching group system (1) which is provided for each phase (R, Y, B),
and has a first main switching group (4) which is formed by a power semiconductor switch (2) and by a capacitor (3) which is connected to the power semiconductor switch (2), with the power semiconductor switch (2) in the first main switching group (4) being formed by a passive electronic component (11) which cannot be driven and has a unidirectional current-flow direction,
which first switching group system (1) has at least one intermediate switching group (7), which is formed by two series-connected power semiconductor switches (5) which can be driven and by a capacitor (6), with the or one intermediate switching group (7) being connected to the first main switching group (4),
and which first switching group system (1) has a second main switching group (9) which is formed by a power semiconductor switch (8), with the power semiconductor switch (8) in the second main switching group (9) being formed by a passive electronic component (11) which cannot be driven and has a unidirectional current-flow direction, and the or an intermediate switching group (7) is connected to the second main switching group (9),
characterized
in that, if there are a plurality of phases (R, Y, B), the first switching group systems (1) of the phases (R, Y, B) are connected in parallel with one another.

2. A converter circuit for at least one phase (R, Y, B), having a first switching group system (1) which is provided for each phase (R, Y, B),
and has a first main switching group (4) which is formed by a power semiconductor switch (2) and by a

capacitor (3) which is connected to the power semiconductor switch (2), with the power semiconductor switch (2) in the first main switching group (4) being formed by a passive electronic component (11) which cannot be driven and has a unidirectional current-flow direction,

which first switching group system (1) has at least one intermediate switching group (7), which is formed by two series-connected power semiconductor switches (5) which can be driven and by a capacitor (6), with the or one intermediate switching group (7) being connected to the first main switching group (4),

and which first switching group system (1) has a second main switching group (9) which is formed by a power semiconductor switch (8), with the power semiconductor switch (8) in the second main switching group (9) being formed by a passive electronic component (11) which cannot be driven and has a unidirectional current-flow direction, and the or an intermediate switching group (7) is connected to the second main switching group (9),

characterized

in that, n further switching group systems (10.1,...10.n) are provided for each phase (R, Y, B) where n ≥ 1 and with the intermediate switching group (7) which is adjacent to the first main switching group (4) being connected in series with the first main switching group (4), and the intermediate switching group (7) which is adjacent to the second main switching group (9) being connected in series with the second main switching group (9), in each of the n further switching group systems (10.1,...10.n),

in that the first main switching group (4) in the first switching group system (1) and the first main switching groups (4) in the n further switching group systems (10.1,...10.n) are connected in series with one another,

in that the second main switching group (9) in the first switching group system (1) and the second main switching groups (9) in the n further switching group systems (10.1,...10.n) are connected in series with one another, and
if there are a plurality of phases (R, Y, B), the n-th further switching group systems (10.n) for the phases (R, Y, B) are connected in parallel with one another.

3. The converter circuit as claimed in claim 1, characterized in that, in the first switching group system (1), the power semiconductor switch (2) in the first main switching group (4) has a further passive electronic component (11) which cannot be driven and has a unidirectional current-flow direction, with the further electronic component (11) being connected in series with the existing electronic component (11), and in that, in the case of the first switching group system (1), the power semiconductor switch (8) in the second main switching group (9) has a further passive electronic component (11) which cannot be driven and has a unidirectional current-flow direction, with the further electronic component (11) being connected in series with the existing electronic component (11).

4. The converter circuit as claimed in one of claims 1 to 3, characterized in that the electronic component (11) is a diode.

5. The converter circuit as claimed in one of claims 1 or 3, characterized in that, in the case of the first switching group system (1), one of the power semiconductor switches (5) which can be driven in each intermediate switching group (7) is connected to the capacitor (6) in the same intermediate switching group (7),
in that, in the case of the first switching group system (1), the intermediate switching group (7) which

is adjacent to the first main switching group (4) is connected in parallel with the first main switching group (4), and

in that, in the case of the first switching group system (1), the intermediate switching group (7) which is adjacent to the second main switching group (9) is connected in parallel with the second main switching group (9).

6. The converter circuit as claimed in claim 3, characterized in that, in the case of the first switching group system (1), the junction point between the two power semiconductor switches (5) which can be driven in each intermediate switching group (7) is connected to the capacitor (6) in the same intermediate switching group (7),

in that, in the case of the first switching group system (1), the intermediate switching group (7) which is adjacent to the first main switching group (4) and has one of the two power semiconductor switches (5) which can be driven is connected to the junction point between the two electronic components (11) in the first main switching group (4), and

in that, in the case of the first switching group system (1), the intermediate switching group (7) which is adjacent to the second main switching group (9) and has the other of the two power semiconductor switches (5) which can be driven is connected to the junction point between the two electronic components (11) in the second main switching group (9).

7. The converter circuit as claimed in one of claims 1, 3, 5, 6, characterized in that, in the case of the first switching group system (1), if a plurality of intermediate switching groups (7) are provided, respectively adjacent intermediate switching groups (7) are connected to one another in a chain.

8. The converter circuit as claimed in claim 2, characterized in that, in the case of the first switching group system (1) and in the case of each of the n further switching group systems (10.1,...10.n) the power semiconductor switch (2) in the first main switching group (4) has a further passive electronic component (11) which cannot be driven and has a unidirectional current-flow direction, with the further electronic component (11) being connected in series with the existing electronic component (11), and
in that, in the case of the first switching group system (1) and in the case of each of the n further switching group systems (10.1,...10.n), the power semiconductor switch (8) in the second main switching group (9) has a further passive electronic component (11) which cannot be driven and has a unidirectional current-flow direction, with the further electronic component (11) being connected in series with the existing electronic component (11).

9. The converter circuit as claimed in one of claims 2 or 8, characterized in that, in the case of the first switching group system (1) and in the case of each of the n further switching group systems (10.1,...10.n), one of the power semiconductor switches (5) which can be driven in each intermediate switching group (7) is connected to the capacitor (6) in the same intermediate switching group (7),
in that, in the case of the first switching group system (1), the intermediate switching group (7) which is adjacent to the first main switching group (4) is connected in parallel with the first main switching group (4), and
in that, in the case of the first switching group system (1), the intermediate switching group (7) which is adjacent to the second main switching group (9) is connected in parallel with the second main switching group (9).

10. The converter circuit as claimed in claim 8, characterized in that, in the case of the first switching group system (1), the junction point between the two power semiconductor switches (5) which can be driven in each intermediate switching group (7) is connected to the capacitor (6) in the same intermediate switching group (7),
in that, in the case of the first switching group system (1), the intermediate switching group (7) which is adjacent to the first main switching group (4) and has one of the two power semiconductor switches (5) which can be driven is connected to the junction point between the two electronic components (11) in the first main switching group (4), and
in that, in the case of the first switching group system (1), the intermediate switching group (7) which is adjacent to the second main switching group (9) and has the other of the two power semiconductor switches (5) which can be driven is connected to the junction point between the two electronic components (11) in the second main switching group (9).

11. The converter circuit as claimed in one of claims 2 or 8 to 10, characterized in that, in the case of the first switching group system (1), if a plurality of intermediate switching groups (7) are provided, respectively adjacent intermediate switching groups (7) are connected to one another in a chain.

12. The converter circuit as claimed in one of claims 2 or 8 to 11, characterized in that the number of intermediate switching groups (7) in each switching group system (10.1,...10.n) in the n further switching group systems (10.1,...10.n) corresponds to the number of intermediate switching groups (7) in the first switching group system (1), and in that, in the case of each of the n further switching group systems

(10.1,...10.n) if a plurality of intermediate switching groups (7) are provided, respectively adjacent intermediate switching groups (7) are connected to one another in series.

13. The converter circuit as claimed in claim 12, characterized in that each intermediate switching group (7) in the first further switching group system (10.1) is connected in series with in each case one intermediate switching group (7) in the first switching group system (1).

14. The converter circuit as claimed in claim 13, characterized in that, if $n \geq 2$, each intermediate switching group (7) in the n-th further switching group system (10.2,...10.n) is connected in series to in each case one intermediate switching group (7) in the (n-1)-th switching group system (10.2,...10.n).